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By James W. Wilson and Turner Wright

**Introduction.**—This bulletin includes results of experiments in feeding proso millet seed to fatten swine. In 1904 results were reported in Bulletins 83 and 86 on feeding proso to pigs and lambs; in 1906 Bulletin 97 furnished results of feeding proso to calves for the production of baby beef, and in 1920 Bulletin 189 presented results of feeding millet silage to fattening cattle. Editions of most of these bulletins are exhausted, but demand for information continues. Consequently, two years ago an additional experiment in feeding this grain to pigs was inaugurated under somewhat different conditions in that a protein supplement was included, the grain was finely ground and a different variety was fed than in our earlier experiments. These features would all have a bearing on the results.

The variety used in the earlier experiments was the Black Vorneszh (Panicum milliaceum). This variety was introduced into this state, through this station, by the United States Department of Agriculture in 1899 and 1900. It was selected for our feeding experiments because it was one of the largest seeded varieties, was a rapid grower, and a comparatively heavier yielder of seed. In 1902 the yield at the home station was 30 bushels an acre while at the forage testing station at Highmore it produced a heavy yield of forage. Other varieties have been introduced, some of which are equal and perhaps superior as fatteners of livestock to the variety mentioned above.

Proso is an easy crop to grow and many prefer it for planting where the stand of corn has failed.

**Recent Experiments.**—In 1930 it was decided to learn more of the feeding value of proso and especially of varieties of more recent introduction. In the first experiment, ground proso, Early Fortune, a red variety, was fed to pigs to determine its relative feeding value to other grains.

The rations used were as follows: Lot I, shelled corn, Lot II, ground barley, and Lot III, ground proso. All lots received tankage, alfalfa hay and a mineral mixture, self-fed. The mineral mixture consisted of 50 pounds of ground limestone, 28 pounds of steamed bone meal, 20 pounds of common white salt, 2 pounds of iron oxide and ½ ounce of copper sulphate.

The proso was ground with a hammer mill, one-eighth inch screen being used. It was run through the mill twice, which resulted in what is known as medium grinding. Some would class this as fine grinding. The barley was also medium ground. The alfalfa hay was of the third cutting which is highly palatable to the pig.

The following data shows the weights, gains, feeds required for 100 pounds of gain and the quantities of different supplements consumed by each lot of pigs for the feeding period.

TABLE 1

| Ration Fed | Shelled corn, tankage, alfalfa, hay, mineral mixture | Ground barley, tankage, alfalfa, hay, mineral mixture | Ground proso, tankage, alfalfa, hay, mineral mixture |
|---|---|---|---|
| Number of pigs | 8 | 8 | 8 |
| Average No. of days fed | 58. | 58. | 79. |
| Average initial weight per pig | 146.3 | 145.5 | 145.7 |
| Average final weight per pig | 255.7 | 241.9 | 253.6 |
| Total gain per pig | 109.4 | 96.4 | 107.9 |
| Average daily gain per pig | 1.90 | 1.65 | 1.37 |
| Feed consumed for 100 lbs. gain | | | |
| Shelled corn | 296.8 | | |
| Ground barley | | 359.13 | |
| Ground proso | | | 501.6 |
| Tankage | 18.0 | 12.5 | 37.8 |
| Alfalfa hay | 2.5 | 3.2 | 7.1 |
| Mineral mixture | .3 | 1.1 | 1.3 |

These data show that pigs fed shelled corn made much faster and cheaper gains than those fed ground proso. Those fed ground barley likewise made faster and cheaper gains than the pigs fed ground proso. In this feeding trial the ground proso gave only 60 per cent the feeding value of the shelled corn. This is a considerably lower value than was obtained in any of the other trials conducted.

The second of this series of feeding trials was conducted in 1934. Shelled corn and ground proso were again compared. The shelled corn used graded No. 2. The proso used was of the Early Fortune variety with a slight admixture of Tambov, another red variety. This proso was clean and of good quality, testing 56 pounds to the bushel. It was thought that perhaps the poor showing of the proso used in the 1930 trial might have been due partly to the proso not being ground fine enough. Accordingly the 3-32 inch screen was used in the 1934 trial and the proso run through twice. This resulted in extremely fine grinding, practically flour. The data showing the results are given in Table 2.

TABLE 2
COMPARISON OF SHELLED CORN WITH GROUND RED PROSO, 1934

| Raton fed | Shelled Corn Tankage Alfalfa hay Mineral mixture | Ground Proso Tankage Alfalfa hay Mineral mixture |
|---|---|---|
| Number of pigs | 8. | 8. |
| Average number of days fed | 78. | 84. |
| Average initial weight per pig | 99.5 | 99.1 |
| Average final weight per pig | 225.2 | 225.7 |
| Total gain per pig | 125.8 | 126.6 |
| Average daily gain per pig | 1.61 | 1.51 |
| Feed consumed for 100 lbs. gain: | | |
| Shelled corn | 359.3 | |
| Ground proso | | 359.3 |
| Tankage | 31.7 | 39.0 |
| Alfalfa hay | 6.0 | 9.6 |
| Mineral mixture | .6 | .6 |

These data show that the pigs fed shelled corn and the pigs fed ground proso required practically the same amount of grain for 100-pound gain. The pigs fed proso, however, required seven pounds more tankage and three and one half pounds more hay for 100 pounds of gain than the pigs fed the shelled corn. This is rather surprising inasmuch as proso contains a higher percentage of protein than does corn. The mineral

requirements for pigs in the two lots were identical. In this feeding trial the ground proso had a feeding value of 95 per cent of the shelled, yellow corn.

The third of this series of experiments was conducted in the late winter and spring of 1935. Four lots of eight pigs each were used in this trial. These pigs were farrowed in the summer of 1934, and consisted of Duroc-Jersey, Poland China and Chester White breeds. They were divided into four lots as evenly as possible with respect to age, sex and weight. The following rations were used for the different lots:

Lot 1—shelled corn, tankage, alfalfa hay, mineral mixture.
Lot 2—ground barley, tankage, alfalfa hay, mineral mixture.
Lot 3—ground red proso (a mixture of Early Fortune and Tambov), tankage, alfalfa hay, mineral mixture.
Lot 4—ground white proso (white Siberian), tankage, alfalfa hay, mineral mixture.

Good yellow corn which would grade No. 2, grown in northwestern Iowa, was used in this experiment. The proso used was of good quality and cleaned as for seeding. All feeds were self-fed, free-choice. The proso was ground in the hammer mill with the 3-32 inch screen as in the 1934 experiment. The results of this feeding trial show that the red proso was slightly more efficient than the white. The ground red proso gave 89 per cent the feeding value of the shelled corn, and practically the same feeding value as the ground barley. The ground white proso gave only 86 per cent of the feeding value of the shelled corn. One thing will be noted in comparing the data for the different lots is that the pigs fed on barley and proso ate much less tankage than those fed on the shelled corn. The pigs fed corn, however, ate considerably less grain per 100 pounds gain than those fed barley or proso. The weights and gains of the pigs, the total feed consumed, and the feed required for 100 pounds gain are given in Table 3.

**TABLE 3**
**A COMPARISON OF SHELLED CORN, GROUND BARLEY, GROUND RED PROSO AND GROUND WHITE PROSO, 1935**

| Lot No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Ration fed | Shelled corn, tankage, alfalfa hay, mineral mixture | Ground barley, tankage, alfalfa hay, mineral mixture | Ground red proso, tankage, alfalfa hay, mineral mixture | Ground white proso, tankage, alfalfa hay, mineral mixture |
| Number of pigs | 8 | 8 | 8 | 8 |
| Average number or days fed | 48 | 48 | 48 | 48 |
| Average initial weight per pig | 144.1 | 145 | 139.4 | 139.2 |
| Average final weight per pig | 230.8 | 228.6 | 215.4 | 213.1 |
| Total gain per pig | 86.4 | 83.6 | 76.0 | 73.9 |
| Average daily gain per pig | 1.8 | 1.74 | 1.43 | 1.51 |
| Feed consumed for 100 lbs gain | | | | |
| shelled corn | 384.9 | | | |
| Ground barley | | 413.3 | | |
| Ground red proso | | | 471.7 | |
| Ground white proso | | | | 477.5 |
| Tankage | 31.5 | 8.1 | 12.7 | 18.1 |
| Alfalfa hay | 7.4 | 7.6 | 10.0 | 8.6 |
| Mineral mixture | .6 | .5 | .9 | .9 |

It should be noted also that the pigs fed on ground white proso consumed more tankage for 100 pounds gain than the pigs fed ground red proso. This difference amounted to 42.5 per cent.

The fourth experiment of the series was conducted in the early part

of 1936. Three lots of eight pigs each used in this trial were fed as follows:

Lot 1.—shelled corn, tankage, alfalfa hay, mineral mixture.
Lot 2.—ground white proso, tankage, alfalfa hay, mineral mixture.
Lot 3.—ground red proso, tankage, alfalfa hay, mineral mixture.

The results show that the rate of gain for the pigs fed the shelled corn and the ground red proso was the same. The pigs fed the ground white proso made slightly slower gains. The grain required for 100 pounds gain was lowest for the shelled corn lot. The pigs fed the ground red proso ranked second in the amount of grain for 100-pound of gain while those fed the ground white proso were the most expensive. The tankage requirement for 100-pound of gain was practically the same for the pigs fed shelled corn and ground red proso, but somewhat higher for the pigs fed the white proso. In this test, the ground red proso gave a feeding value of 93 per cent that of shelled corn while the ground white proso had only 81 per cent the feeding value of the shelled corn. Again it should be noted that the pigs fed the white proso required more tankage for 100-pound of gain than the pigs fed the red proso. In this case the difference amounted to 29.2 per cent. This difference in the amount of tankage required was not so great as in 1934, however, the grain requirements for the two lots in 1934 were practically identical, while in 1936 the pigs fed the white proso required 52 pounds more proso for 100 pounds of gain than the pigs fed the red proso. In this experiment the ground white proso had only 87 per cent the feeding value of the red. The data showing the weights and gains of the pigs and the amounts of feed consumed are given in Table 4.

**TABLE 4**
**COMPARISON OF SHELLED CORN WITH GROUND RED AND GROUND WHITE PROSO, 1936**

| Lot No. | 1 | 2 | 3 |
|---|---|---|---|
| Ration fed | Shelled corn, Tankage Mineral Mixture Alfalfa Hay | Ground white, Proso Tankage Mineral Mixture Alfalfa Hay | Ground red, Proso Tankage Mineral Mixture Alfalfa Hay |
| Number of pigs | 8 | 8 | 8 |
| Average number of days fed | 58 | 58 | 58 |
| Average initial weight per pig | 143.4 | 161.6 | 162.6 |
| Average final weight per pig | 253.1 | 260.3 | 271.3 |
| Total gain per pig | 109.75 | 98.7 | 109.0 |
| Average daily gain per pig | 1.89 | 1.7 | 1.88 |
| Feed consumed for 100 lbs. gain | | | |
| Feed consumed for 100 lbs. gain | | | |
| Shelled corn | 423.3 | | |
| Ground white Proso | | 498.2 | |
| Ground Red Proso | | | 446.7 |
| Tankage | 28.4 | 38.5 | 29.8 |
| Alfalfa Hay | 8.1 | 9.1 | 11.7 |
| Mineral Mixture | .5 | .4 | .6 |

A summary of the data for the last three years in which the ground red proso was compared with the shelled corn shows that the pigs fed shelled corn made slightly more rapid gains at a lower feed cost than the pigs fed the ground red proso. The average value of the ground red proso for the three trials as compared with the shelled corn was 93 per cent.

Inasmuch as proso contains a higher percentage of protein than

shelled corn, it was thought that the pigs fed the proso would show a much lower tankage consumption than the pigs fed the shelled corn. This was not the case, however, as the tankage requirement for the two groups was practically the same. These data are given in Table 5.

**TABLE 5**
**FINELY GROUND RED PROSO COMPARED WITH SHELLED CORN FOR FATTENING PIGS**
**Summary of 1934, 1935, and 1936 Experiments**

| Ration fed | Shelled corn Tankage Alfalfa hay Mineral mixture | Finely ground red proso Tankage Alfalfa hay Mineral mixture |
|---|---|---|
| Number of pigs | 24. | 24. |
| Average number of days fed | 61. | 65. |
| Average initial weight per pig | 130.0 | 133.7 |
| Average final weight per pig | 236.4 | 237.6 |
| Total gain per pig | 107.8 | 107.3 |
| Average daily gain per pig | 1.75 | 1.60 |
| Feed consumed for 100 lbs. gain | | |
| Shelled corn | 388.0 | |
| Ground Red Proso | | 417.5 |
| Tankage | 30.5 | 29.4 |
| Alfalfa Hay | 7.0 | 10.4 |
| Mineral Mixture | .6 | .7 |

Chemical analysis of prosos used in the 1934, 1935, and 1936 experiments show practically the same protein content for the red and white prosos, thus the higher tankage requirement for the pigs fed on white proso as compared with the red cannot be attributed to the difference in protein content of the two grains, but to some other factor. These experiments were conduucted each year during late winter and early spring. The difference possibly could be attributed to a higher vitamin content for the red proso. Further experimental work is planned to determine this point. In these trials, also, all of the feeds were fed free-choice method. It is entirely possible that the pigs fed proso ate more tankage than was needed to supply their actual protein requirements. Further experimental work will be conducted to determine if feeding a limited amount of protein supplement with proso rather than feeding the supplement, free-choice would give more economical results.

The chemical analysis of the proso used in 1934, 1935, and 1936 are given in Table 6.

**TABLE 6**

| | Red Proso 1935 | | Red Proso 1936 | |
|---|---|---|---|---|
| | As Received | Moisture Free | As Received | Moisture Free |
| Moisture | 10.77 | | 9.78 | |
| Ash | 2.77 | 3.13 | 2.88 | 3.19 |
| Fat | 4.19 | 4.70 | 4.38 | 4.86 |
| Protein | 14.92 | 16.73 | 14.50 | 16.07 |
| Crude Fibre | 7.19 | 8.05 | 8.20 | 9.10 |
| Nitrogen Free Extract | 60.16 | 67.30 | 60.26 | 66.78 |
| | 100.00 | 100.00 | 100.00 | 100.00 |
| | **White Proso 1935** | | **White Proso 1936** | |
| | As Received | Moisture Free | As Received | Moisture Free |
| Moisture | 9.02 | | 10.29 | |
| Ash | 2.82 | 3.15 | 3.06 | 3.43 |
| Fat | 4.38 | 4.87 | 4.21 | 4.60 |
| Protein | 14.37 | 15.80 | 14.50 | 16.71 |
| Crude Fibre | 7.24 | 7.95 | 8.12 | 9.10 |
| Nitrogen Free Extract | 62.17 | 68.23 | 59.82 | 66.16 |
| | 100.00 | 100.00 | 100.00 | 100.00 |